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First Named Inventor	Donald J. Williams et al.
Art Unit	3611
Examiner Name	Daniel G. Depumpo
Total Number of Pages in This Submission	Attorney Docket Number: 3174-000008

ENCLOSURES ***(check all that apply)***

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment / Reply
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  - ☐ Affidavits/declaration(s)
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- ☐ Status Letter
- ☒ Other Enclosure(s) *(please identify below)*:

  Appelant's Response to Examiner's Answer; and Return Postcard.

Remarks

The Commissioner is hereby authorized to charge any additional fees that may be required under 37 CFR 1.16 or 1.17 to Deposit Account No. 08-0750. A duplicate copy of this sheet is enclosed.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

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Date	September 30, 2004		

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appeal No. _____

Application No.:	09/824,980
Filing Date:	April 3, 2001
Applicant:	Donald J. Williams et al.
Group Art Unit:	3611
Examiner:	Daniel G. Depumpo
Title:	ELECTRIC POWER STEERING SYSTEM INCLUDING A SEGMENTED STATOR SWITCHED RELUCTANCE MOTOR
Attorney Docket:	3174-000008

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APPELLANT'S RESPONSE TO EXAMINER'S ANSWER

ARGUMENT SUMMARY

As described in detail in the Appellant's Brief filed on June 1, 2004, the claims are generally directed to an electric power steering system for a vehicle. The electric power steering system includes a steering wheel and a steering shaft connected to the steering wheel. A switched reluctance motor is coupled to the steering shaft for reducing driver effort that is required to turn the steering wheel. The switched reluctance motor includes a stator having a plurality of circumferentially-spaced stator segment assemblies. The stator segments assemblies each include a stack of stator plates forming a stator segment core and winding wire wound around the stator segment core. A rotor defines a plurality of rotor poles. The rotor tends to rotate relative to the stator to maximize the inductance of an energized winding. A drive circuit energizes the winding wire around each stator segment assembly based on a rotational position of the rotor. More simply presented, the claims include the combination of an electric power steering system, a switched reluctance motor and a stator defined by a plurality of stator segments.

As discussed in Appellant's Brief and as further detailed below, traditional power steering systems are not cost effective if implemented using non-segmented switched reluctance motors. These power steering systems would further require a rotor position transducer or a sensorless control system. Rotor position transducers are typically too expensive. Sensorless control systems for non-segmented stator switched reluctance motors have not been sufficiently accurate or, if sufficiently accurate, are also too expensive.

By providing a switched reluctance motor having a segmented stator in a power steering system according to the present invention, the accuracy of the winding process has been improved. The improved winding accuracy allows tighter tolerances with respect to the inductance and resistance values, which makes sensorless control easier and less costly. In this manner, the power steering system of the present invention is more cost effective than traditional power steering systems.

The Examiner's rejections are based on dismantling the novel combination of the present invention and identifying prior art references that supposedly teach the individual features of the novel combination. The Examiner then imbues one of ordinary skill in the art with knowledge of the claimed invention, while none of the prior art references of record convey or suggest this knowledge. As a result, that which Appellant has taught is being used against Appellant.

RESPONSES TO THE REJECTIONS

1. Claims 1 – 5 and 8 stand finally rejected under 35 U.S.C. §103(a) as being unpatentable over Kliman et al. '089 in view of Applicants' admitted prior art (APA) and further in view of Nishiyama et al. '153. This rejection is respectfully traversed.

Independent claim 1 claims an electric power steering system that includes:

> "...a switched reluctance motor coupled to said steering shaft ..., wherein said switched reluctance motor includes a stator including a plurality of circumferentially-spaced stator segment assemblies..."

Applicants note that none of the prior art references cited by the Examiner are directed toward power steering systems with segmented switched reluctance motors.

Kliman et al. fails to teach or suggest a power steering system having a switched

reluctance motor that includes a plurality of segmented stator assemblies. Nishiyama et al. fails to cure the deficient teachings of Kliman et al. More specifically, Nishiyama et al. discloses a permanent magnet electric machine, which is a wholly different type of machine than a switched reluctance electric machine, having a segmented stator. Because permanent magnet electric machines would not require a rotor position sensor for control, the teachings of Nishiyama et al. cannot be extended to switched reluctance motors to cure the deficient teachings of Kliman et al.

Applicants' admitted prior art (APA) also fails to cure the deficient teachings of both Kliman et al. and Nishiyama et al. More specifically, Applicant's APA outlines the reasons why traditional switched reluctance electric machines **are not** implemented in power steering systems.

As discussed in detail in Appellant's Brief, Applicants have identified similar, significantly older references that support the same teachings as those found in Kliman et al. and Nishiyama et al. In particular, switched reluctance motors with non-segmented stators that are similar to those taught by Kliman et al. have been around since the mid 1800's. Permanent magnet motors with segmented stators that are similar to those shown in Nishimaya et al. are shown in Sheldon (U.S. Patent No. 2,688,103, which was issued in 1952). While the age of the references, standing alone, is not persuasive on the issue of non-obviousness, the age of the references coupled with the failure to solve the problem (i.e., more cost effective power steering systems) in light of the presumed knowledge of the references is persuasive on the issue of obviousness. As stated in **In re Neal**:

> Appellant points out that the references are "quite old" and considers that an indication that this combination would not have been obvious. Such a position is not impressive "absent some showing that the art tried and failed to solve some problem notwithstanding its presumed

knowledge of the references." **In re McGuire**, 57 CCPA 706, 712, 416 F.2d 1322, 1327, 163 USPQ 417, 421 (1969).

In re Neal 179 USPQ 56, 57 (CCPA 1973).

In rejecting the claims, the Examiner has consistently imbued one of ordinary skill in the art with knowledge of the teachings of the prior art. Carrying this further, although one of ordinary skill in the art presumably has knowledge of the references, a more cost effective power steering system as provided by the present invention is not present in the prior art despite known problems relating to sensorless control techniques. More specifically, none of the prior art references have proposed an electric power steering system that includes a switched reluctance machine with a segmented stator as set forth in claim 1. Segmenting the stator as taught by Applicants allows the stator segments to be precisely wound. The precise winding enables the inductance and resistance characteristics to be controlled from one stator segment to another and from one machine to another. The controlled inductance and resistance characteristics, in turn, solves the problem of implementing sensorless control systems.

Applicants further note that there are several significant problems in the Examiner's application of the prior art references. First, Kliman et al. is directed to the problem of detecting and isolating faults in a switched reluctance machine (col. 1, lines 6-11). Kliman et al. does not address the problem of making the stator of a switched reluctance machine easier to wind. It is therefore unclear why one would look to Nishiyama et al., which relates to a different type of machine, to solve problems relating to sensorless rotor position sensing. Further, the Examiner has alleged that it would be obvious to segment the stator in Kliman et al. because segmenting the stator is common in the machine art. This statement is not true with respect to switched reluctance machines.

The Examiner's reasoning is exactly the type of speculation that formed the basis for reversal of the Examiner and the Board in **In re Jones**:

> Conspicuously missing from this record is any evidence, other than the PTO's speculation (if it be called evidence) that one of ordinary skill in the herbicidal art would have been motivated to make the modifications of the prior art salts necessary to arrive at the claimed 2-(2 '-aminoethoxy) ethanol salt... We conclude that the PTO did not establish a prima facie case of obviousness.

In re Fine also rejected this reasoning. There, the prior art reference related to a similar device – namely gas chromatographs. **Id.** The prior art chromatograph detected sulfur while Applicants' chromatograph detected nitrogen. **Id.**

Both **In re Fine** and **In re Jones** reject the proposition that the teaching, suggestion or motivation required by §103 is present simply because the references all relate to the same broad category of art or that unsupported general knowledge of one skilled in the art can be relied upon. The Examiner is essentially asserting that it would be obvious for skilled artisans to try the features of one device in another similar device. The CAFC expressly rejected the "obvious to try theory" in **In re Fine** at 1598.

The sole motivation for making the proposed combination is provided by Applicants' specification, which is impermissible hindsight reconstruction. As succinctly stated by the CAFC:

> But this court has said, "To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher." W. L. Gore , 721 F.2d at 1553, 220 USPQ at 312-13. It is essential that "the decisionmaker forget what he or she has been taught at trial about the claimed invention and cast the mind back to the time the invention was made . . . to occupy the mind of one skilled in the art who is

> presented only with the references, and who is normally guided by the then-accepted wisdom in the art." Id . One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.

In re Fine at 1600.

With regard to claims 2 – 5 and 8, Applicants note that each ultimately depends from claim 1, which defines over the prior art as discussed above. Therefore, claims 2 – 5 and 8 also define over the prior art.

In view of the foregoing, the combination of the references fail to teach or suggest all of the elements of the claim, as set forth. Therefore, Applicants respectfully request that this Board overturn the Examiner's rejection of claims 1 – 5 and 8.

In addition, Claim 8 further specifies that the drive circuit employs sensorless rotor position techniques.

2. Claims 9 – 13, 16 – 19, 22 and 23 stand finally rejected under 35 U.S.C. §103(a) as being unpatentable over Kliman et al. '089, APA and Nishiyama et al. '153 as applied to claims 1 – 5 and 8, and further in view of McCann '591 and Ackermann '678. This rejection is respectfully traversed.

Applicants incorporate the above discussion regarding claims 1 – 5 and 8.

Independent claim 9 claims an electric power steering system that includes:

> "a switched reluctance motor coupled to said steering shaft...; and
> a stator for said switched reluctance motor including a plurality of circumferentially-spaced stator segment assemblies ..., wherein inter-pole stator slots are defined between adjacent stator segment assemblies,... and winding wire that is wound around said stator segment core and that defines a slot fill between 70 and 95%."

Independent claim 16 claims an electric power steering system that includes:

> "a switched reluctance motor that is coupled to said steering shaft ... including ... a stator that is mounted on an inner surface of said motor housing, said stator including a plurality of circumferentially-spaced stator segment assemblies, wherein said stator segment assemblies include a stack of stator plates forming a stator segment core and winding wire that is wound around said stator segment core and that defines a slot fill that is between 70 and 95%, wherein each of said stator plates has a generally "T"-shaped cross-section, a radially outer rim section, and a tooth section that extends radially inwardly from a center portion of said radially outer rim section.

As discussed in Appellant's Brief and in further detail above, none of the prior art references (Kliman et al., Nishiyama et al. or Applicants' APA) teach or suggest implementing a segmented switched reluctance electric machine in a power steering system (in other words, a stator comprising segmented stator assemblies).

Applicants note that neither McCann nor Ackermann et al. cure the deficient teachings of Kliman et al., Nishiyama et al. and Applicants' APA. Although McCann discusses a switched reluctance motor with indirect position sensing, McCann fails to teach or suggest a power steering system that includes a switched reluctance electric machine having segmented stator assemblies. McCann is specifically limited to disclosing a switched reluctance electric machine having a solid stator.

Ackermann et al. is directed toward a method of constructing a salient motor pole for an electric machine to increase slot fill. More importantly, however, Ackermann et al. does not teach or suggest implementing a switched reluctance machine having segmented stator assemblies in a power steering system. Therefore, Ackermann et al. also fails to cure the deficient teachings of Kliman et al., Nishiyama et al. and Applicants' APA.

Further, neither McCann nor Ackermann show, teach or suggest a switched reluctance electric machine with a segmented stator and with a slot fill of 70-95%. McCann shows a switched reluctance machine with a non-segmented stator. As such, either transfer winding or needle winding would typically be used to wind the stator teeth. These methods are generally limited to less than 65% slot fill (Specification at [0011]) and certainly cannot obtain the claimed slot fill of 70-95%. Ackermann states that salient pole motors have slot fills of 40-50%. However, induction machines, according to Ackerman, have slot fills approaching 70% because bobbin and oscillating guns can be used col. 2, lines 16-19). Ackerman goes on to describe a method for increasing slot fill of **salient pole machines** substantially higher than slot fills obtainable by prior art techniques (e.g. substantially higher than 40-50%) (col. 3, lines 7-27, col. 6, lines 42-45). Ackermann does not improve slot fill of induction machines. Therefore, neither Ackermann nor McCann teach a segmented switched reluctance machine with 70-95% slot fill.

With regard to claims 10 – 13, 17 – 19 and 22, Applicants note that each ultimately depends from either claim 9 or claim 16, which define over the prior art as discussed above. Therefore, claims 10 – 13, 17 – 19 and 22 also define over the prior art.

In view of the foregoing, the combination of the references fail to teach or suggest all of the elements of the claim, as set forth. Therefore, Applicants respectfully request that this Board overturn the Examiner's rejection of claims 9 – 13, 16 – 19 and 22.

Claim 23 depends from claim 1, which is discussed in detail above. Because claim 1 defines over the prior art, claim 23 also defines over the prior art and Applicants respectfully request that this Board overturn the Examiner's rejection of claim 23.

3. Claim 6 stands finally rejected under 35 U.S.C. §103(a) as being unpatentable over Kliman et al. '089, APA and Nishiyama et al. '153 as applied to claims 1 – 5, 8 – 13, 16 – 19 and 22, and further in view of Trago et al. '661. This rejection is respectfully traversed.

Applicants incorporate the comments set forth above with regard to claims 1 – 5, 8 – 13, 16 – 19 and 22.

Claim 6 ultimately depends from claim 1, which defines over the prior art, as discussed in detail above. Therefore, claim 6 also defines over the prior art.

Claim 6 includes first and second end caps connected to opposite axial ends of the stator segment core and first and second end cap retainer sections that connect the first and second end caps. As provided in claim 1, the stator is made up of a plurality of stator segments assemblies, each of which include a stator segment core. As a result, each stator segment core includes the end caps and the retainer sections.

Trago et al. fails to teach or suggest end caps and retainer sections for individual stator segment cores of a stator. The disclosure of Trago et al. is limited to a single-piece stator (see Figure 7) and motor housing end caps (25,26) that house the motor components.

Accordingly, the combination of the references fail to teach or suggest all of the elements of the claim, as set forth. Therefore, Applicants respectfully request that this Board overturn the Examiner's rejection of claim 6.

4. Claims 14 and 20 stand finally rejected under 35 U.S.C. §103(a) as being unpatentable over Kliman et al. '089, APA, Nishiyama et al. '153, McCann '591 and

Ackermann '678 as applied to claims 9 – 13, 16 – 19, 22 and 23, and further in view of Trago et al. '661. This rejection is respectfully traversed.

Applicants incorporate the comments set forth above with regard to claims 1 – 5, 8 – 13, 16 – 19 and 22.

At the outset, Applicants note that claims 14 and 20 ultimately depend from claims 9 and 16, respectively, which define over the prior art, as discussed in detail above. Therefore, claims 14 and 20 also define over the prior art.

Claims 14 and 20 include first and second end caps connected to opposite axial ends of the stator segment core and first and second end cap retainer sections that connect the first and second end caps. As provided in claims 9 and 16, the stator is made up of a plurality of stator segments assemblies, each of which include a stator segment core. As a result, each stator segment core includes the end caps and the retainer sections.

As discussed in detail above, Trago et al. fails to teach or suggest end caps and retainer sections for individual stator segment cores of a stator. The disclosure of Trago et al. is limited to a single-piece stator (see Figure 7) and motor housing end caps (25,26) that house the motor components.

Accordingly, the combination of the references fail to teach or suggest all of the elements of the claim, as set forth. Therefore, Applicants respectfully request that this Board overturn the Examiner's rejections of claims 14 and 20.

5. Claim 7 stands finally rejected under 35 U.S.C. §103(a) as being unpatentable over Kliman et al. '089, APA and Nishiyama et al. '153 as applied to claims 1 – 5, 8 – 13, 16 – 19 and 22, and further in view of Mitsui '309. This rejection is respectfully traversed.

Applicants incorporate the comments set forth above with regard to claims 1 – 5, 8 – 13, 16 – 19 and 22.

Applicants note that claim 7 depends from claim 1, which defines over the prior art, as discussed in detail above. Therefore, claim 7 also defines over the prior art. Accordingly, Applicants respectfully request that this Board overturn the Examiner's rejection of claim 7.

6. Claims 15 and 21 stand finally rejected under 35 U.S.C. §103(a) as being unpatentable over Kliman et al. '089, APA, Nishiyama et al. '153, McCann '591 and Ackermann '678 as applied to claims 9 – 13, 16 – 19, 22 and 23, and further in view of Mitsui '309. This rejection is respectfully traversed.

Applicants incorporate the comments set forth above with regard to claims 19 – 13, 16 – 19, 22 and 23.

Applicants note that claims 15 and 21 ultimately depend from claims 9 and 16, respectively, which define over the prior art, as discussed in detail above. Therefore, claims 15 and 21 also define over the prior art. Accordingly, Applicants respectfully request that this Board overturn the Examiner's rejections of claims 15 and 21.

Response to Examiner's Response to Applicant's Argument

In the first paragraph under section (11), the Examiner essentially states that he is ignoring the "switched reluctance" language of the claim. Initially, Applicants believe that this is the first time that this argument has been raised. Secondly, Claim 1 recites a switched reluctance motor "having circumferentially-spaced stator segment assemblies" and describes the operation of a switched reluctance motor – specifically that "the rotor tends to rotate relative to the stator to maximize the inductance of an energized winding." Third, Applicants have consistently argued that Kliman fails to show, teach or suggest a power steering system including a switched reluctance motor with a segmented stator. No one disputes the fact that the language of the claims is directed to those skilled in the art. Nor does the Examiner dispute the fact that skilled artisans know precisely what is meant by a switched reluctance motor. The Examiner is clearly not entitled to ignore the language of Claim 1 reciting a switched reluctance motor.

In the second paragraph of section (11) on page 8, the Examiner incorrectly characterizes Applicants' arguments. As stated above, Applicants have consistently argued that Kliman fails to show, teach or suggest a power steering system including a switched reluctance motor with a segmented stator. The Examiner, on the other hand, consistently ignores the segmented aspect of the switched reluctance motor in Applicant's arguments, which he cannot do.

In the third paragraph of section (11) on page 8, Applicants point out the fact that switched reluctance motors such as the one disclosed in Kliman have not been used in power steering systems because they are commercially uncompetitive. The cost of the transducer or the sensorless systems with sufficient accuracy has been prohibitive. The

segmented nature of Applicants switched reluctance motor is one reason that Applicants' switched reluctance motor can be competitive.

In the fourth paragraph of section (11) on page 8, the Examiner points out that the applied references are not old. Applicants provided references that support the same teachings as the applied references. Applicant established that the teachings are old and that the art tried and failed to solve the problem of a cost competitive switched reluctance machine. Applicants showed significantly earlier references that support the same teachings as those references applied by the Examiner. The Examiner has never addressed or disputed this point. Furthermore, Applicants also supported the fact that the prior art tried and failed to produce a cost competitive switched reluctance motor.

In the fifth paragraph on pages 8-9, Applicants do not dispute the fact that the claimed sensorless control techniques were old. Rather, Applicants argued that by segmenting the stator of the switched reluctance motor, these control techniques can be used far more effectively, which is another point that the Examiner has failed to address.

CONCLUSION

In view of the above presented discussion, Applicants believe that the pending claims are patentably distinguishable over the art cited by the Examiner. Accordingly, Applicants respectfully request that this Board reverse the final rejection of claims 1 – 23.

Please charge any deficiency or credit any overpayment in this matter pursuant to 37 C.F.R. § 1.16 or § 1.17 to Deposit Account No. 08-0750.

Respectfully submitted,

Dated: 9/30/04

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Enclosures: Three (3) copies of Appellant's Brief

MDW/RPM
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APPENDIX

1. An electric power steering system for a vehicle comprising:

a steering wheel;

a steering shaft connected to said steering wheel; and

a switched reluctance motor coupled to said steering shaft for reducing driver effort that is required to turn said steering wheel, wherein said switched reluctance motor includes a stator including a plurality of circumferentially-spaced stator segment assemblies that include a stack of stator plates forming a stator segment core and winding wire wound around said stator segment core, a rotor defining a plurality of rotor poles, wherein said rotor tends to rotate relative to said stator to maximize the inductance of an energized winding, and a drive circuit that energizes said winding wire around said stator segment assemblies based on a rotational position of said rotor.

2. The electric power steering system of claim 1 further comprising:

a worm gear connected to said steering shaft; and

a worm threadably engaged to said worm gear, wherein said rotor of said switched reluctance motor is connected to said worm.

3. The electric power steering system of claim 1 wherein each of said stator plates includes:

a radially outer rim section; and

a tooth section that extends radially inwardly from a center portion of said radially outer rim section.

4. The electric power steering system of claim 3 further comprising:

an insulation layer located between said winding wire and said stator segment core.

5. The electric power steering system of claim 1 further comprising:

projections extending from opposite sides of a radially inner end of said tooth section.

6. The electric power steering system of claim 5 further comprising:

first and second end caps connected to opposite axial ends of said stator segment core; and

first and second end cap retainer sections that extend along said projections and that connect said first and second end caps,

wherein said first and second end caps and said first and second end cap retainer sections reduce movement of said winding wire during use.

7. The electric power steering system of claim 1 wherein said stator plates of said stator segment core include radial and lateral slits and first and second central portions that are deformed using a punch and press fit to hold said stack of stator plates together.

8. The electric power steering system of claim 1 wherein said drive circuit senses rotor position using sensorless rotor position techniques.

9. An electric power steering system comprising:

a steering wheel;

a steering shaft connected to said steering wheel;

a switched reluctance motor coupled to said steering shaft for reducing driver effort that is required to turn said steering wheel; and

a stator for said switched reluctance motor including a plurality of circumferentially-spaced stator segment assemblies that are arranged around an inner surface of said motor housing, each of said stators segment assemblies defining a salient stator pole that extends in a radially inward direction, wherein inter-pole stator slots are defined between adjacent stator segment assemblies, and said stator segment assemblies including a stack of stator plates forming a stator segment core and winding wire that is wound around said stator segment core and that defines a slot fill between 70 and 95%.

10. The electric power steering system of claim 9 further comprising:

a worm gear connected to said steering shaft; and

a worm threadably engaged to said worm gear, wherein said rotor of said switched reluctance motor is connected to said worm.

11. The electric power steering system of claim 9 wherein each of said stator plates includes:

a radially outer rim section; and

a tooth section that extends radially inwardly from a center portion of said radially outer rim section.

12. The electric power steering system of claim 11 further comprising:

an insulation layer located between said winding wire and said stator segment core.

13. The electric power steering system of claim 9 further comprising:

projections extending from opposite sides of a radially inner end of said tooth section.

14. The electric power steering system of claim 13 further comprising:

first and second end caps connected to opposite axial ends of said stator segment core; and

first and second end cap retainer sections that extend along said projections and that connect said first and second end caps,

wherein said first and second end caps and said first and second axial end cap retainer sections reduce movement of said winding wire during use.

15. The electric power steering system of claim 9 wherein said stator plates of said stator segment core include radial and lateral slits and first and second central portions that are deformed to hold said stator segment core together.

16. An electric power steering system for a vehicle comprising:

a steering wheel;

a steering shaft connected to said steering wheel; and

a switched reluctance motor that is coupled to said steering shaft to reduce driver effort that is required to turn said steering wheel, said switched reluctance motor including a motor housing, a rotor that rotates relative to said motor housing, and a stator that is mounted on an inner surface of said motor housing, said stator including a plurality of circumferentially-spaced stator segment assemblies, wherein said stator segment assemblies include a stack of stator plates forming a stator segment core and winding wire that is wound around said stator segment core and that defines a slot fill that is between 70 and 95%, wherein each of said stator plates has a generally "T"-shaped cross-section, a radially outer rim section, and a tooth section that extends radially inwardly from a center portion of said radially outer rim section.

17. The electric power steering system of claim 16 further comprising:

a worm gear connected to said steering shaft; and

a worm threadably engaged to said worm gear, wherein said rotor of switched reluctance motor is connected to said worm.

18. The electric power steering system of claim 16 further comprising:

an insulation layer located between said winding wire and said stator segment cores.

19. The electric power steering system of claim 16 further comprising:

projections extending from opposite sides of a radially inner end of said tooth section.

20. The electric power steering system of claim 19 further comprising:

first and second end caps connected to opposite axial ends of said stator segment core; and

first and second end cap retainer sections that extend along said projections and that connect said first and second end caps,

wherein said first and second end caps and said first and second end cap retainer sections reduce movement of said winding wire during use.

21. The electric power steering system of claim 16 wherein said stator plates of said stator segment core include radial and lateral slits and first and second central portions that are deformed to hold said stator segment core together.

22. The electric power steering system of claim 16 further comprising:

a drive circuit connected to said winding wire of said stator segment assemblies, wherein said drive circuit senses rotor position using sensorless rotor position techniques.

23. The electric power steering system of claim 1 wherein said winding wire defines a slot fill that is between 70 and 95%.